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SUGGESTIONS FOR FIELD STUDIES OF MAMMALIAN LIFE-HISTORIES.

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INTRODUCTION.[1]

For many years leading museums have been acquiring exhibit and study material representative of different groups of birds and mammals, until at present the American collections are in many respects unsurpassed by those of any other country of the world. This relative completeness of research collections permits increased attention to the study of life histories.

[1] This paper is the outgrowth of an unpublished memorandum to field workers, written June 12, 1917, by E. W. Nelson, Chief of the Bureau of Biological Survey, regarding the desirability of increased attention to the gathering of life-history material. Helpful suggestions were found also in an unpublished memorandum for field biologists written several years ago by Dr. Joseph Grinnell, director of the Museum of Vertebrate Zoology, University of California. The writer's grateful acknowledgment for help in connection with the paper is also due the members of the Biological Survey staff.

Few lines of inquiry possess greater interest and attractiveness than that which deals with the normal activities of the wild animal in its natural environment. Such studies also have a very practical value. The resulting data are often essential to the solution of problems in the prevention and control of animal-borne diseases, in the conservation of natural resources, and in the elimination of waste and the stimulation of production in the several branches of agriculture, including general farming, horticulture, grazing, and forestry. "Not a single farm product but is affected directly or indirectly by some animal activity * * *" says Prof. Herbert Osborn (1919, p. 112).

The benefits to the student of a more intimate acquaintance with the living things about him can scarcely be overestimated. Moreover, a more widespread appreciation of nature, with the resulting inspiration to more rugged and healthful thinking and living, has an important bearing upon our national welfare.

RELATION OF FIELD AND LABORATORY METHODS.

Field and laboratory methods each possess advantages which justify the use of both. The possibility of a complete control of environmental factors under laboratory conditions has sometimes led to undue enthusiasm for this type of research. The advantages of laboratory investigations on the one hand are often compensated for in a loss of normality of response on the part of the organism. This is especially true of birds and mammals. On the other hand, if trustworthy conclusions as to behavior are to be reached, it is necessary to associate work in the laboratory with direct observations of the animal in a natural state; and many of the most important details of animal life-histories can never be learned in the laboratory.

Two authorities on this subject may be quoted here: Prof. William E. Ritter (1917, p. 402) says, " * * * the future's progress in the biological sciences will be accomplished by a far closer, more vital interdependence between researches out in nature and researches in the laboratory." And Theodore Roosevelt (1917, p. 11) states, in words which carry their own authority, " * * * it is essential to recognize that the best scientific men must largely work in the great out-of-doors laboratory of nature. It is only such out-doors work which will give us the chance to interpret aright the laboratory observations."

EQUIPMENT.

Equipment for field investigation of habits of mammals need not be elaborate and will often be at hand where needed. Pick, shovel, ax or large hatchet, trowel or large spoon, brushcutter, grasscutter, tapeline, sketch pad, coordinate paper, and writing materials usually

suffice for ordinary work. A bump of resourcefulness on the part of the investigator is perhaps the most important item of initial equipment. Some of the problems in the life histories of birds and mammals are full of difficulty, and require special equipment in particular cases. Many methods remain to be devised, and instruments to be invented.

Less refined modes of inquiry should give way to intensive investigations of a quantitative character as rapidly as practicable. There is great need for the development of the ecologic method of approach in the study of the animal and its environment. Field plot or quadrat methods should be combined with observations on the behavior of animals under confinement, the whole based on a thorough knowledge of normal field conditions over wide areas. No attempt is here made more than to refer to the development of this important side of the work, with the permanent field stations, specially trained personnel, and comparatively elaborate equipment which it implies.

The increasing employment of the camera in the study of habits is peculiarly desirable. Dr. Frank M. Chapman (1900, p. 1) states the case for the scientific value of bird photography in the following words:

> There are certain matters, such as a bird's song, its time of migration, etc., which must be set forth with the pen; there are others, such as its haunts, nesting site, nest, eggs, the appearance and development of its young, where the camera is so far superior in its power of graphic representation that it is a waste of time to use the former when circumstances permit the utilization of the latter.

Though much less used in connection with mammal study, due perhaps to the nocturnal habits of these animals and the lesser accessibility of their haunts and homes, the value of the camera in this province can scarcely be overestimated. Photographs should be secured of living animals in characteristic attitudes, of specimens, especially those freshly killed, of animals in traps, of characteristic food plants or other vegetation, and of noteworthy features of topography or environment. Photographic record is desirable also of tracks of animals, their systems of runways, beds or shelters, nests, piles of stored food or "hay," feces, claw marks on trees, cropped vegetation, and general habitat. The animal-portrait work of the day is of such high character that ordinarily it will not be possible for the biologist in the field to attempt to equal it; but it is of such importance that wherever possible a professional animal-photographer should be a member of a field party.

DATA THAT ARE IMPORTANT.

The study of mammalian life-histories opens a field of activity for any sincere student with an enthusiasm for closer acquaintance with wild life. No human being and no book, but nature herself, is the supreme authority in natural history. The beginner may make as important an observation as the veteran investigator. The efforts of all are needed if our fund of information is in any sense to be complete.

The points incorporated in the list which follows are some of those concerning which additional detailed information is desirable. No one individual can hope to acquire full information on all the items listed. The suggestions have been compiled to serve as a guide to what should be sought in the course of regular field work. They should also serve to encourage the recording of facts which often come to the notice of the observer but which are not ordinarily set down because of their supposed triviality.

No attempt is made to present a complete catalogue. Several legitimate fields of inquiry to which contributions can be made by field workers are omitted entirely; for example, the relation of habits to bodily structure. Almost any one of the suggestions included can be followed up and expanded with pleasure and profit, and will be found to possess a surprising degree of interest and often of practical importance.

For information regarding known habits of the various mammals, the student is referred to Seton's Life Histories of Northern Animals (1909) and to Nelson's Wild Animals of North America (1918).

MEANS OF DETECTING PRESENCE OF PARTICULAR SPECIES.

Tracks, distances between footfalls; differences in tracks with different speeds or movements of animal.

Feces—abundance, shape, size, color, composition, place of deposit.

Claw marks on trees, logs, or ground.

Tooth marks on wood or bone.

Wallows, dust baths, beds, forms, nests, shelters, runways, holes, trails, cropped or harvested vegetation.

HABITAT RELATIONS.

Relation of soil, rocks, water, air, climate to habits and distribution.

Effects of unusual climatic conditions, as storms, floods, and forest fires; degree and rapidity of recovery from disaster.

Relation of animal populations to climatic cycles.

INTERRELATIONSHIPS OF SPECIES.

Friends.

Enemies—times of activity; enemies in youth, middle age, old age.

Prey—modes of capture.

Parasitic habits of species with reference to each other.

Parasites, internal and external.

Bacteria and disease germs (carriage and transmission of disease to stock or to mankind; species as victims; decimation of animal populations; periodicity of contagious diseases in animals; degree and rapidity of recovery).

Adaptations of animals to each other or to plants.

Competition between species, particularly between those closely related.

TIMES OF ACTIVITY.

Hours of beginning and cessation of daily activity.
Unusual activity, as of diurnal species at night or of the nocturnal by day.

MIGRATION.

Local or general movements before and after breeding.
Dates of appearance and disappearance (especially of bats).
Extent and direction of movements, local and general.
Causes of migration—food supply, climatic, physiological.
Unusual migratory movements, as the spasmodic irruptions of lemmings, with causes therefor.

HIBERNATION AND ESTIVATION.

Date of entering upon and emerging from hibernation.
Causes of hibernation and estivation—the relation of climate, soil, physiology, and food supply.
Condition of animal before, during, and after hibernation.
Details as to completeness or incompleteness of torpidity.
Place of hibernation or estivation.
Habits associated with hibernation and estivation.

MOVEMENT.

Modes of running, jumping, climbing, digging, swimming, flying.
Gait; speed; endurance.
Other activities.

VOICE AND OTHER MEANS OF INTERCOMMUNICATION.

Calls in general; courting; alarm; challenge; warning calls.
Descriptions of barking, baying, screaming, howling, squeaking, squealing, singing, roaring, bugling.
Warning attitudes; flash signals.
Emission of glandular secretions.
Odor posts.
Touch.
Other means of intercommunication.
Organization of communities—leaders, sentries, rank and file.

HABITS ASSOCIATED WITH FEEDING AND DRINKING.

List of foods eaten.
Food at different seasons.
Physical characteristics and habits associated with food getting.
Conveyance and storage of food; hay making.
Dependence on water; times and manner of drinking; other associated habits.

INDIVIDUAL CHARACTERISTICS.

General disposition and temperament; intelligence; attitudes; strength; vitality; tenacity of life; courage; esthetic sense; eating of young by parents; cannibalism in general; degree of sociability; playfulness; length of life.
Sanitation, cleanly or filthy habits.
Reactions to sound, light, odor, taste, touch.
Relation of physical characteristics to sense reactions.

RELATION OF CHARACTERISTICS AND HABITS TO EXISTENCE AND SURVIVAL.

Movements.
Attitudes.
Instincts.
Intelligence.
Coloration—concealing, disruptive, directive, warning, mimicking.

BREEDING HABITS.

Courting antics.
Relations of the sexes in general; polygamy (manner of acquisition of harem by male, mode of protection of harem, bachelor males); polyandry; promiscuity; monogamy.
Dates of heat and copulation; associated habits.
Length of period of gestation.
Date of birth of young.
Number of young.
Family life; relation of father to family; care of young—feeding; mode of carrying; how long cared for by parents; precocious or backward; length of time in nest; behavior.
Behavior of adults in postbreeding season; in winter.
Hybridization between related species.

NESTS, SHELTERS, AND OTHER PLACES OF RESORT.

Natural resorts at different seasons.
Shelter chambers in general.
Lairs; dens; forms; beds.
Nests—plan, elevation, accurate measurements; storage chambers; breeding chambers; chambers for deposit of excrement or for other purposes.
Nests for different purposes; unoccupied nests.
Approaches to nests—trails, burrows, tunnels, or runways; protection of nests through the closing of burrows during the daytime or in other ways.
Habits associated with nest approach.
Extent of home range.

MISCELLANEOUS.

Are any mammals strictly crepuscular?
Periodic phenomena of any kind in mammals, aside from migration and hibernation.
Habits as affected by the seasons of the year.
Effect of long days, very dark days, full moon, dark of the moon, on activity.
Use of glands of various sorts, as hip glands of meadow mice, metatarsal glands of deer, musk glands, anal glands.
Weights and dimensions of bats; precise hour of appearance in the evening and disappearance in the morning; numbers and habits as observed in caves; relative numbers of the sexes; methods of hanging; condition of females with reference to pregnancy.

PRESENT AND FORMER STATUS.

Present and former numbers of valuable species, as fur-bearing and game animals, and of pests or those otherwise important; causes of increase or decrease.
Estimates and counts of numbers of animals per unit of area.
Fluctuations in numbers from year to year, and causes.
Plagues, due to unusual increase or destructiveness of species; origin, course, and virulence; natural checks and methods of control.

WILD LIFE AND THE COMMUNITY.

Local names; local ideas concerning wild life.
Sentiment regarding game laws and legislation.
Trapping and hunting methods in local use; prices received for pelts or animals sold.
Relation of mammals to the public health; to agriculture.
Possible undeveloped resources in mammals, as of flesh for food, fur or hides for clothing, or other useful animal products for various purposes.
Possibilities of utilization, through domestication or semidomestication, of beneficial species.

CONCLUSION.

Any department of natural history, if pursued in the proper spirit, is replete with interest. But none, perhaps, promises a greater return in real satisfaction than the field study of the home life of wild mammals and birds. Reference has already been made to the practical importance of the investigations, which will often bear directly upon problems in other lines of inquiry.[1]

It is universally conceded that the work throughout, if it is to be done well, must be founded on an adequate taxonomic basis; but the time has arrived when a new emphasis is possible on the intensive study of the living animal in its natural environment.

The outline just presented will indicate the richness of the field. In order to do it justice, the work of many individuals and institutions throughout the country is required. On the taxonomic side each State should have at least one representative collection of the mammals and other vertebrates to be found within its borders. The building up of private collections should likewise be encouraged. There are still great gaps in the material representative of the larger groups of mammals and of most of the smaller ones, even in the larger collections in this country.

But the incompleteness in our information regarding life histories is even more conspicuous. Universities, colleges, normal and high schools, State scientific surveys, State and city museums, and State associations and commissions for the protection of fish and game, as well as the United States Department of Agriculture, all have an opportunity to serve their respective constituencies and the country in this field.[2]

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[1] These related lines of inquiry include problems in scientific agriculture, geographical distribution, phenology, migration, ecology, physiology, medical zoology, behavior, game protection and the conservation of natural resources, morphology, heredity, organic evolution, and economic zoology.

[2] The Bureau of Biological Survey, U. S. Department of Agriculture, solicits correspondence from any individual or institution planning work on the relationships or life histories of mammals or birds, and will be glad to assist with advice or suggestions as opportunity may be given.

LITERATURE EXAMINED.

BAILEY, Vernon.

1912. Directions for field work of the assistants of the Biological Survey: Form 69, Bur. Biol. Surv., pp. 1–10, U. S. Dept. Agr., May 27, 1912.

CHAPMAN, Frank M.

1900. Bird studies with a camera. Pp. xiv+218, 110 illustrations.

COUES, Elliott.

1877. [Note on information desired regarding North American mammals, in column of "Scientific News."] Amer. Nat., *11*, pp. 505–506, Aug., 1877.

NELSON, Edward W.

1918. Wild Animals of North America. Nat. Geogr. Soc., pp. 385–612, numerous illustrations in text, title page, 2 unnumbered pages, frontispiece.

OSBORN, Herbert.

1919. Zoological aims and opportunities: Science, N. S., *49*, pp. 101–112, Jan. 31, 1919.

RITTER, William E.

1917. "Back to nature" scientifically as well as emotionally; the case for more field work in biology: Amer. Mus. Journ., *17*, pp. 403–406, Oct., 1917.

ROOSEVELT, Theodore.

1917. Productive scientific scholarship: Science, N. S., *45*, pp. 7–12, Jan. 5, 1917.

SETON, Ernest Thompson.

1909. Life-histories of northern animals. 2 vols., continuously paged, pp. xxx+1267, maps 68, pls. 100, 267 figs. in text.

STRONG, R. M.

1914. On the habits and behavior of the herring gull, *Larus argentatus* Pont.: Auk, *31*, pp. 22–49, pls. 3–10, 1 fig. in text, Jan., 1914.

TAVERNER, P. A.

1915. Suggestions for ornithological work in Canada: Ottawa Nat., *29*, pp. 14–18, 21–28, 1915.